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• World Production and Trade



Foreign Agricultural Service • U. S. Department of Agriculture

Foreword

The Department of Agriculture is continuously receiving requests for information relating to world banana production and trade. To facilitate answering these requests, the authors have endeavored to bring together from various sources general information on this subject. For more detailed data, reference should be made to the studies listed on page 19.

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Bananas: World Production and Trade

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Introduction

Although bananas were one of man's first foods, only during the past 50 years have they become a popular food item in all parts of the world. Their exact homeland is not known but it is believed to have been Southeast Asia.

From Asia, banana rhizomes were probably taken to the east coast of Africa by early travelers, and then on to the west coast, probably by Arab traders. Here, they were discovered by Portuguese explorers in 1482. The Portuguese took plants to the Canary Islands from which they were brought to the New World--to Santo Domingo--by a Spanish missionary in 1560. From here the banana plant spread to other Caribbean islands and to Central and South America.

Bananas were virtually unknown in the United States and Europe until the latter part of the 19th century because ships were slow and refrigeration had not been developed, and so the fruit would spoil before it reached the northern market. By the turn of the century the transportation problems and the hazards of growing bananas in tropical jungles had been overcome and bananas were appearing regularly in world markets.

World banana trade grew very rapidly during the first 30 years of the 20th century and, by 1935-39, an average of over 111 million stems (50 pounds each) were being exported annually. During World War II, trade was disrupted, and banana exports decreased markedly; and it was not until 1953 that they again reached their prewar level. Since 1953, world banana trade has increased every year. During 1960 world exports were the highest on record, totaling over 178 million stems, an increase of 10 million over 1959 and 47 percent higher than the 1951-55 average.

Bananas account for 8 percent to 12 percent of retail produce sales, depending on the season and the merchandising practices of the individual stores. Per capita consumption during 1960 rose to 23 pounds, but this was not a normal year; heavy imports flooded the U.S. market, causing considerable financial loss to major importers.

During 1961, a number of U.S. importers formed the National Banana Association with headquarters in New Orleans. The purpose of the association is to improve sales, increase consumption, assist processors and retailers, and work for the general betterment of the entire banana industry.

Factors Affecting Production

Bananas are grown in practically all tropical areas of the world. However, they do best in hot, humid areas where temperatures do not fall below 55° F., and seldom rise

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above 105° F. Banana plants require large quantities of water; consequently, areas with abundant rainfall throughout the year are ideal. Irrigation is necessary where rainfall is light during certain periods of the year. A fertile, well-drained soil, neutral in reaction, with good aeration is desirable.

Wind is another important factor. The banana is a nonwoody plant, closely related to the canna lily and the orchid. The trunk of the banana plant consists of overlapping leaf sheaths and is over 85 percent water. Pulling the plant apart is much like taking apart a stalk of celery. It is, therefore, easily blown over by heavy winds, especially when mature and bearing fruit, as it is top-heavy during this stage of development. Every year millions of plants are blown down by winds in many of the producing areas. These occurrences are referred to as "blowdowns", and most of the fruit cannot be salvaged.

Disease is probably the most important factor affecting banana production today. Of the several diseases that affect banana plants, fusarium wilt (also known as Panama disease) and Sigatoka are by far the two most important.

Fusarium wilt is a soil-borne fungus called Fusarium oryzenarium f. cubense. It was prevalent in the banana plantations of Costa Rica and Panama as early as 1900 but was not identified until 1904, and the causal organism not until 1910. As the banana industry expanded through the tropical world, this disease followed, with the result that most banana producing areas are infected with it. The losses due to this disease and the cost of combating it amount to millions of dollars each year.

Its effect on banana plants may vary, but usually the diseased plant shows faint yellowing of the lower and outer leaf blades and petioles. This is followed either by progressive yellowing of the older leaves and eventual leaf collapse at the petiole, or by leaf collapse at the petiole accompanied by little or no leaf yellowing. Sometimes the leaf sheaths that form the outer covering of the pseudostem show longitudinal splitting. It usually takes from 4 to 6 weeks from the time the first yellowing appears for complete destruction of the plant. The most common internal symptom is discoloring of the vascular strands varying from light yellow to dark brown. The discoloration usually appears first in the outer or oldest leaf sheaths.

The fungus attacks the vascular system of the plant, which causes it to die of starvation. The organism first invades the roots of the banana plant and proceeds internally along the root to the rhizome where it develops extensively in the vascular tissue, before passing up the vascular system into the pseudostem and the outer leaf petioles. The disease spreads mainly by contact of the root system of healthy plants with spores released by diseased plants. The fungus can also be spread by irrigation water, drainage, animals, men, and equipment. The texture and acidity of the soil appear to influence how rapidly the disease spreads. Light-textured loam and sand loam soils with an acid reaction favor rapid spread of the disease.

No successful techniques have been developed to permanently rid soils of the fungus responsible for Panama disease. The only alternatives left when a field becomes infested are abandoning the field or growing varieties of bananas that are resistant to the disease. Cavendish-type banana plants are being grown successfully in many areas infested with fusarium wilt.

Sigatoka disease caused by the organism (Cercospora musali) was first found in the Fiji Islands. It has since spread to every major banana-producing area of the world. This disease directly affects the leaves of the banana plant. The first visible indication is usually the appearance of short, light brownish-green lines running parallel to the veins of the leaves. These lines subsequently enlarge and form dried-up, oblong patches about $\frac{1}{2}$ inch in length; and they are muddy brown or black in color. The leaf tissue around the spots begins to die, and the leaf is eventually destroyed.

The effect of Sigatoka disease on the fruit is indirect and results from the reduced functional leaf surface of the plant. If bunches mature on plants that are severely affected,

the fruit may fall and fail to ripen. If the fruit is nearly mature when the disease attacks the plant, the bunch will ripen unevenly and the fingers will be undersized and angular. The flavor of the fruit is not affected, but it cannot be marketed because of its small size and deformed shape. Another problem is that, because the fruit is retarded in development, it hangs longer on the plant before harvesting and is apt to be more mature than it appears, thus ripening in transit.

Sigatoka disease is controlled by spraying the banana plants with copper-based or organic fungicides. Spray cycles vary from 1 to 3 weeks during spray season, depending on local conditions. The organism is favored by rainy, moist weather, and thus is most prevalent in rainy seasons.

Bacterial wilt, or Moko, is also an important disease affecting banana production. Reference was made to it as early as 1840, making it one of the oldest known diseases of bananas. It is found throughout the banana-producing areas in varying degrees of severity. The first symptom in a mature plant is the development of a yellow-green color in the inner leaves; then the blade normally turns to a dirty yellow color at a point close to the petiole or leaf stalk. This is followed by a breakdown of the petiole and wilting and death of the center leaf. The effect on the fruit depends on the development of the bunch. If the plant has recently fruited, fruit growth may be completely stopped. The fruit bunch appears but the fingers do not develop and eventually turn black and shrivel up. If the plant is infected during late stages of fruit development, the fruit do not show any symptoms on the outside but the pulp may be decaying in some of the fingers. The internal symptoms of this disease are very similar to fusarium wilt, in that many of the vascular strands of the pseudostem become discolored. In mature plants, the symptoms are so similar that it is difficult to tell which disease is attacking the plant. To control the spread of the disease, infected plants and adjacent healthy plants are treated with oil or herbicides to form a buffer area, and tools are disinfected with a 10-percent formaldehyde solution. Other measures taken are the destruction of wild hosts, followed by dry fallowing with plowing, and continuing surveys of infected areas for early detection and immediate treatment of new cases.

In addition, there are many virus diseases that affect banana plants and several that affect the fruit, roots, and rhizomes. However, these do not have the economic significance of fusarium wilt, Sigatoka, or Moko.

Diseases spread very quickly in the Tropics and are difficult to control. Therefore, a continuous spraying program must be carried out to keep them from destroying the plants. The methods of applying sprays vary according to the size of the plantation. In areas such as Central America where most of the plantations are large, very elaborate spraying systems are used. These systems usually consist of a series of pipes radiating from a central Bordeaux mixing station. Large pumps at the station send the Bordeaux mixture throughout the plantation via the pipes, which have nozzles at various intervals



Spraying banana plants to control Sigatoka. This and fusarium wilt (also called Panama disease) are the main banana diseases and major factors in production.



Newly dug banana rhizomes are washed before they are planted.

applying the spray to the plants. In areas like Ecuador and Africa where most of the bananas are grown on smaller plantations, spraying is usually done by hand, using a knapsack sprayer. Airplanes and helicopters are also used in many areas and are now becoming more important than ground spraying systems.

Production and Harvest

Banana plantations or farms are usually located in the wet, low-lying tropical jungles, where the best growing conditions are found. Therefore, one of the first steps in establishing a banana field is the construction of a good drainage system.

The layout of the drainage system depends, of course, on the slope of the field. On flat land the drains can be laid in any convenient direction; on steep slopes, they should be laid on a contour. The number of drains will vary with the slope of the land, texture of the soil, and amount of rainfall. The steeper the slope and the lighter the soil, the fewer will be the number of drains required. In areas with abundant rainfall, such as Central America, large ditches resembling canals are dug, and the excess water is removed from the area either by gravity or the use of pumps. During the dry season, this system can be used to supply irrigation water. In arid areas, such as the Canary Islands, the problem is to get water to the banana plants; consequently, drains are not used. In fact, the banana terraces are normally completely enclosed to conserve the scarce rain water.

Once the fields have been drained, the next step is cleaning away the jungle underbrush. This is done, for the most part, by hand, using machetes and other hand implements. Once the bushes, vines, and so forth are cleared away, the land is marked out in straight rows, and holes about 1 foot deep are dug to accommodate the planting material. There are several types of planting materials that can be used but the general practice is to plant pieces of rhizome, called bits of rootstocks, which are obtained by digging up fully grown



Above, Honduras banana plantation is being irrigated by overhead spray system. Right, 10-day-old banana bud.

plants and cutting the bulbous base into pieces. Each bit must have at least one eye or sprout, which will develop into a banana plant.

Sometimes the whole rhizome or young plants, called "sword suckers" are planted instead of bits. The spacing of the plants can vary from 150 to 2,000 plants per acre, depending on such factors as size of plant, type of soil, size of fruit desired, and topography. A general rule of thumb is to allot 60 - 120 square feet per plant.

Once bits are placed in the ground, they are covered over with soil and then any large trees that remain standing are felled and left lying in the banana field. Banana plants grow out around the logs, which decay very rapidly in the hot, humid climate. Sometimes the felled trees and underbrush are burned before the bits are planted but, by doing this, the soil is robbed of valuable organic matter and leaching of minerals is increased.

In some areas the land is plowed before the bits are planted--if the topography permits. This can only be done in areas such as Jamaica, where the land was originally covered by light brush and therefore has no large roots.

If the land is too steep to plow, hand forking may be used to work the soil. The amount of cultivating depends on the soil texture, with the general rule that the lighter the soil the less cultivation needed. In general, however, the current tendency is to cultivate as little as possible, since overcultivation can damage the soil.

About a month after the bits are planted, a small shoot appears--or shoots (depending on the number of eyes on the bit). The weaker shoots are removed and only the strongest one is left to grow. In some banana-growing areas, if no shoots appear, young sturdy plants--"sword suckers"--are brought from neighboring farms and planted. It is very important to have strong healthy plants in the original planting, as the success of a plantation depends heavily on this.





Harvesting bananas. One worker lowers fruit while his companion prepares to cut it free from plant.

It usually takes a banana plant 1 year to reach maturity. A full-grown banana plant has about a dozen long green leaves that crown its top, and its height varies from 12 to 30 feet, depending on variety and growing conditions.

The varieties of bananas cultivated throughout the world are numerous. However, practically all the bananas entering world trade are either Gros Michel or the Cavendish type. There are some apple bananas and red bananas exported, but they are insignificant when compared with total world trade. The Gros Michel is the most common banana exported, due to its size and suitability for shipping.

The Gros Michel under good cultural practices is a tall and vigorous plant and bears symmetrical stems with large fingers. Its main weakness is its susceptibility to fusarium wilt. It is a native of the Far East and first appeared in the New World around the early 19th century on the island of Martinique. It was probably brought there from the Far East by sailors. During the early 1800's it was brought to Jamaica by a French botanist named Jean Pouyet. From Jamaica it spread to Cuba and Central and South America.

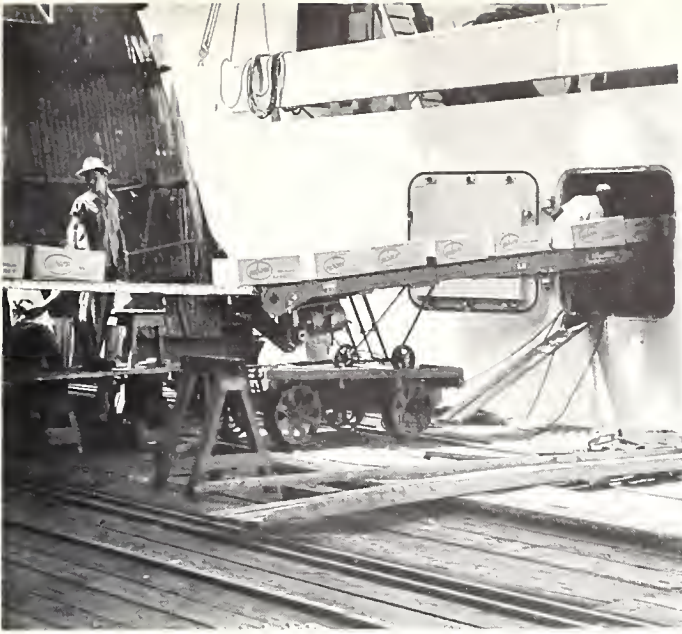
There are a number of Cavendish-type banana varieties grown for export, namely Dwarf Cavendish, Giant Cavendish, Robusta, and Lacatan. The Cavendish-type banana plants are resistant to fusarium wilt, which

accounts for their increased popularity. In the case of the Dwarf Cavendish, the plants are short and stocky, which lessens its susceptibility to wind damage or blowdown. The fruit of the Cavendish-type varieties vary in size and are more susceptible to bruising in transit than the Gros Michel. This is believed to be caused by the individual fingers pointing outward from the central stem while the fingers of the Gros Michel curve inward. However, with the development of plantation boxing, bruising of Cavendish-type bananas in transit is being overcome.

Banana plantations must be continuously cleared of underbrush until the plants develop enough leaves to shade out such growth. After a plantation has been established, it is necessary to clean an average of six times a year to keep the undesirable plants from taking over. Practically all of the cleaning is done by hand. Underbrush can also be controlled by mulching, use of chemicals, and growing cover crops.

Just before the banana plant reaches its greatest growth (about 8 months on new plantings and 10 months on subsequent crops) the large flower bud pushes its way up the center of the plant and out through the throat of the plant. The stem of the flower bud continues to grow and soon bends downward toward the earth. Within a few days, the petals, or bracts, of the bud roll back one by one and fall off, revealing tiny fingers of bananas ready to fill out and grow into the huge stem of bananas. The tiny fingers originally point down, but as they grow they turn outward and upward towards the sun. Each banana plant bears only one stem of fruit.

The first fruit from new plantings is ready to harvest anywhere from 10 to 13 months after planting. The stage of maturity at which it is harvested partly depends on the distance



Above, loading boxed bananas into ship's "reefer." Right, hydro-cooled bananas are packed into 40-lb. boxes. Boxed bananas, packed at the plantation for shipment is the industry's newest "package."



Grocer unpacks bananas from box in which they were packed at the plantation. This kind of packaging eliminates much of the handling required by a stem of bananas.

it has to travel to market. Bananas are always harvested hard and green, even if they are going to be consumed in the Tropics. If the fruit is left to ripen on the plant, the outer skin will split, attracting fruit flies and insects, which cause it to decay very rapidly. Ripe bananas are also too soft and perishable to ship.

While the banana plant is growing, new shoots are continually appearing at the base of the plant, and have to be removed. After the growth of the mother plant, one shoot is allowed to grow and becomes known as the "daughter" plant. Three to six months later a second shoot, usually derived from the daughter plant, called the "granddaughter" plant, is also allowed to grow. Thus, by the time the fruit is harvested, the next two generations are ready to provide a continuous supply of bananas.

The method used to harvest bananas may vary, but usually the plant is cut by nicking the stalk a few feet below the stem of bananas with a sharp knifelike implement on the end of a long pole. This causes the stalk of the plant to slowly bend over, and by using the long pole, the stem is gently lowered until the bunch of bananas rests upon the shoulder of a "carrier". A "cutter", using a sharp machete, then cuts the stem free from the plant and later cuts the entire mother plant 6 feet above the ground.

Grading and Packaging

After the bananas are harvested, the next step is preparing them for shipment. The fruit is first graded, and any undersized stems or defected ones are discarded. Although there are no formal U.S. or international standards for bananas, the fruit is graded at production points and classified under commercial standards recognized within the banana trade.

Stems are divided into classes, based on the number of hands of not less than 10 fingers each. "Nines" are stems containing nine developed hands. "Eights", "sevens" and "sixes" are similarly designated. Stems of less than six hands are not readily marketable.

Grade at shipping point designates the maturity of the fruit when harvested. Grades are three-quarter, light full three-quarter, full three-quarter, and full. Full refers to a stem on which the individual bananas are plump and well rounded. Fruit in Latin America for the U.S. market is cut "full three-quarter" and for the British and continental European markets, "three-quarter". A less fully developed fruit is required for the latter markets because this kind holds better--less fruit becomes ripe during the longer voyage.

The fruit for shipment is then washed with a sodium bisulfate solution to remove any spray residues that remain. The washing procedure also kills any spiders or insects that are hiding among the fingers. The washing is done by passing the fruit through mechanical washing stations, where the sodium bisulfate solution and then a water rinse are sprayed on the hanging stems, moving on a mechanical conveyer. The fruit is then stacked, butt down, and left to dry. After drying, each stem is covered with a polyethylene bag to protect the fruit during transit. These bags are perforated to insure good air circulation.

Over the years, numerous experiments have been made on packaging bananas. Last year, they were directed at the use of shrink film materials, consumer cartons, and labeling for consumer identification. The year before, in 1960, one international firm began the first commercial importations of plantation-boxed bananas into the United States. This was the culmination of many years' study on cutting the fruit from the stem at the plantation and shipping it in wooden or corrugated boxes. The success of this method of packaging is obvious from import figures: box imports have risen sharply to about 15 million boxes in 1961, with a continuing rise planned by major importers.

Plantation-boxed bananas have found a ready market in the United States because they are of consistently high quality, offer wholesale and retail convenience, and, although the initial cost to the wholesaler is higher than for the fruit on the stems, savings in handling and processing make them competitive at retail.

In Honduras and Costa Rica, large boxing plants have been erected. In these plants, the hands of bananas are cut from the central stem, graded, selected for quality and size, and placed in trays for hydrocooling. The hydrocooling process consists of passing the trays of fruit through a long shower of cool water in order to quickly remove the field heat. After removal from hydrocooling, the hands are packed in corrugated cartons containing 42 pounds net weight. These cartons of bananas are stored in controlled-temperature storage rooms until transferred to dockside. Loading of refrigerated vessels is handled smoothly and efficiently by means of a system of power and skate conveyors, which simultaneously carry boxes into the various compartments of the ship.

Transportation

The distances from farm to port may vary anywhere from 10 to 300 miles. Types of inland transportation also vary from country to country, and sometimes within countries. In Central America most of the fruit is shipped to ports by rail. Cars with slatted sides

are generally used to provide maximum ventilation for stems, while insulated cars are used to maintain the cool temperature of boxed bananas. Before the fruit is loaded, the sides of the rail car are also padded with sections of the psuedo stems, which are like sponge rubber, and with banana leaves to minimize bruising. An average rail car will carry 225 to 250 stems of bananas.

In areas where most of the bananas are produced by small individual growers (as in Ecuador, Colombia, and Africa), the bananas are usually shipped by motor truck or barge. The trucks circulate throughout the banana farms buying the stems at the farmer's gate. Any stems that are undersized or have defects are discarded, and only the best quality fruit is bought. Farmers who are located near the water load their bananas onto barges, which carry them down the main rivers to the ports.

When bananas reach the ports, refrigerated ships are waiting to load. The method used to load the ship depends, of course, on the port facilities available. At the better ports, large gantry cranes with an endless belt of rubberized canvas pockets are used. Dock workers carry the banana stems from the railroad cars or trucks and place them in canvas pockets, in which the stems move into the hold of the ship. In ports where docking facilities are not available or are very poor, workers carry the stems through side doors into the ship's reefers. As the bananas are being loaded into the ship, any stems that were bruised during their trip from the farms are discarded. Stems are shipped from the Tropics by count rather than weight.

The holds of banana ships are compartmentalized, and an individual ship may have 6 to 14 compartments. Each compartment is further subdivided by moveable horizontal bin boards, which prevent the load from shifting as the ship rolls and pitches. A grated floor is laid on the bottom of each compartment to insure good air circulation on the bottom of the load as well as on top. The banana stems are stowed in the bins with the bottom layer always placed in a vertical position with the butt end down. The second layer can be either vertical or horizontal. If there is a third tier, the second layer is stacked vertically and the third tier is placed horizontally. Each ship has from 9 to 10 separate refrigeration units which circulate cool air to the compartments. The temperature of the compartments is held between 52° and 58° F., depending on the variety and maturity of the fruit. If the temperature is allowed to rise higher than this range, the fruit will ripen too fast and spoil before it reaches the consumer. Temperatures below 52° (Gros Michel) and 55° (Cavendish-type) will damage the bananas and cause the peel to turn a dark color. Although the fruit itself is not damaged, the color of the peel lowers the marketability of the fruit. Each compartment is insulated to reduce losses in cool air and prevents the whole cargo from damage if one or more of the refrigeration units should break down. Each compartment is also equipped with vents to exhaust carbon dioxide, heat, and other ripening byproducts.

Most of the ports in the United States and Western Europe have elaborate machinery for unloading bananas. The stems are lifted out of the ship's refrigerated storage compartments by vertical conveyor belts similar to those used in loading, and are carried to horizontal belts which run from the ship's side to the railroad side tracks and truck loading platforms. As the stems move along on horizontal belts, they are graded according to size and maturity. Labels of different colors are sometimes used to designate size and maturity. As the grader calls out the classification, the appropriate color tag is pasted on the bunch.

After the stems are graded, workers pick them off the belts and load them into the waiting trucks and railroad cars. A careful tally is kept on the quantity and grade of the fruit sold, but the rail cars and trucks are usually weighed. Once the fruit is loaded into the trucks and rail cars, the purchaser generally takes ownership of the fruit.

The processing operation centers around the ripening room, where time, temperature, and humidity are carefully controlled. These rooms are well insulated, and can be heated or refrigerated. Their capacity generally ranges from 250 to over 500 stems or 300 to 700 boxes. By controlling the temperature and humidity within the chamber, the

ripening process of the fruit can be determined exactly for the day the fruit is needed. When stems of bananas reach the stage of ripeness as shown by color of peel, they are taken out of the ripening rooms and the hands are removed from the main stem. After careful selection, the hands are then placed into boxes which usually have a capacity of 40 pounds net. If the bananas are shipped in the 40-pound carton or crate from the tropical point of production, then these cartons are delivered to the ripening room. When the fruit reaches the desired color it is moved directly to the retail store in the original shipping container, thereby eliminating a major part of U.S. processing operations. The processor may be an independent jobber servicing many independent and chain stores, or he may be a representative of a chain of stores or a cooperative, many of whom now buy direct from importers.

Exporting Countries

Although bananas can be grown in practically all tropical areas of the world, commercial production is limited to a few. In fact, over 70 percent of the 178 million stems entering world trade during 1960 originated in 8 countries: Ecuador, Brazil, Colombia, Panama, Honduras, Guatemala, Costa Rica, and the Canary Islands. The remaining exports are mostly from Africa and Taiwan, with a few from Oceania.

Ecuador shipped 47 million stems (50 lb. basis) during 1960, or 26 percent of the total world exports, which makes it by far the world's largest banana exporter. However, it has only been during the past 10 years that Ecuador has become the most prominent country in world banana trade. Before World War II, exports from Ecuador were averaging only 1.9 million stems annually. After the war, production picked up slightly and, by 1950, exports were up to 8.7 million stems, but were still considered a minor item in the local economy. Since 1950, however, production has increased at a phenomenal rate, primarily because no Sigatoka disease control was necessary until 1956-57 but also because the government's road-building projects have opened the previously inaccessible low coastal areas. The use of oil spray by airplane (which began in 1957) for treatment of Sigatoka disease has aided in maintaining high exports. The result is that today banana exports are Ecuador's main source of foreign exchange.

Bananas can be grown easily and at a low cost in the coastal lowlands of Ecuador, which gives this area an advantage over most of the other banana-producing countries. The climate is hot and humid, the soil is fertile, and rainfall is abundant during 4 or 5 months of the year. High winds are rare, thus eliminating the risk of having entire plantations blown down. This also reduces the cost of production. Panama disease is a problem in many areas, but is not yet a serious overall problem; consequently, there are vast amounts of land available for banana production, and the popular Gros Michel variety can be grown. Most of the plantations are small and individually owned. When these lands were originally opened, Sigatoka disease was not a problem, and costs of production were even lower, because a costly spray program was not necessary. However, Sigatoka disease has become widespread and spraying is necessary through the use of helicopters.

The main problem facing the Ecuadorian banana producers is quality control. Due to the small size of the plantations, most growers cannot afford irrigation equipment to water the plants during dry spells. Hence, some Ecuadorian bananas are much smaller than fruit grown in areas such as Central America where the plantations are irrigated. The methods of handling bananas from the time they leave the plantations until they are loaded into the ships also need improvement. The present system of piling the stems into a motor truck and hauling them over rough roads for many miles causes severe losses and damage to the fruit. However, the low cost of production enables Ecuador to continue increasing its share of the world market.

TABLE 1.--Exports of bananas from specified countries, average 1935-39 and 1951-55, annual 1958-60

Continent and country	Average		1958	1959	1960 ¹
	1935-39	1951-55			
	1,000 stems	1,000 stems	1,000 stems	1,000 stems	1,000 stems
Middle America:					
Costa Rica.....	4,569	15,644	13,297	9,402	9,950
Dominican Republic.....	291	1,779	3,784	4,434	7,953
Guadeloupe.....	1,810	3,152	4,147	5,136	5,080
Guatemala.....	8,405	6,706	7,617	8,832	12,074
Honduras.....	11,723	14,290	21,534	19,276	17,200
Jamaica.....	13,042	5,251	5,581	5,819	6,100
Martinique.....	1,336	2,435	4,160	5,795	5,565
Mexico.....	13,103	2,078	1,111	1,262	372
Nicaragua.....	1,982	465	83	93	150
Panama, Rep. of.....	9,779	8,611	11,780	12,811	13,400
Trinidad & Tobago.....	73	81	198	177	187
Windward Islands.....	228	677	2,686	4,273	4,497
Total.....	66,341	61,169	75,978	77,310	82,528
South America:					
Brazil.....	9,366	8,775	11,969	9,395	10,000
Colombia.....	7,475	7,548	8,505	10,287	10,036
Ecuador.....	1,920	19,109	38,052	44,838	46,740
Total.....	18,761	35,432	58,526	64,520	66,776
Africa:					
Cameroun.....	907	2,943	3,220	2,553	1,618
Canary Islands.....	5,319	7,710	6,594	8,063	8,280
Congo, Rep. of.....	73	990	1,252	1,371	1,600
Ghana.....	56	9	75	63	200
Guinea, Rep. of.....	1,882	4,249	2,862	2,513	3,000
Ivory Coast.....	517		2,034	2,381	3,202
Mozambique.....	389	624	576	501	756
Nigeria.....	2,337	4,041	3,866	3,016	2,994
Somali, Rep. of.....	983	1,595	1,984	2,034	3,441
Total.....	12,463	22,161	22,463	22,495	25,091
Asia:					
Lebanon.....	---	154	694	564	600
Taiwan.....	5,570	1,460	1,825	1,993	1,900
Total.....	5,570	1,614	2,519	2,557	2,500
Oceania.....	552	692	1,440	1,423	1,500
World total.....	103,687	121,068	160,926	168,305	178,395

¹ Preliminary.

Note: Converted to 50-pound stems.

The United States is Ecuador's largest market, taking about 75 percent of its total exports, based on 1960 trade. West Germany is second, taking 13 percent, and practically all the remaining fruit goes to other West European markets and to Chile.

Before the spectacular rise of Ecuador's banana industry, Colombia and the Middle American countries were the world's leading exporters of bananas. Just before World War II (1935-39) these countries accounted for 71 percent of all the bananas entering world trade, while Ecuador's share was only 2 percent. Although there has been some variation among the individual countries, this area as a whole has not been able to keep its share of the world market during the postwar era. During 1951-55 its share had dropped to 57 percent and during 1960 it was only 52 percent.

During the 1935-39 period, Mexico, Jamaica, Honduras, and Panama were the world's 4 largest exporters of bananas, shipping an average of 13.1 million, 13.0 million, 11.7 million, and 9.8 million stems per year, respectively. This was over 46 percent of the world's total exports.

During 1960, exports from Mexico (all of which went to the United States) were down to 0.4 million stems. The decline of Mexico's banana industry started right after the expropriation of the American-owned plantations in the States of Tobasco and Veracruz. The local growers have not been able to control diseases or produce high-quality fruit.

Exports from Jamaica have also decreased at a fast rate since the war, and only 6.1 million stems were exported during 1960. The inroads of Panama disease have been the main factor causing this decline. However, high labor costs and the expense of fertilization and control of Sigatoka disease also seem to have discouraged the production of bananas. Jamaica ships all its bananas to the United Kingdom, where they enter under Commonwealth preferential treatment. Practically all the bananas now exported are of the Cavendish type variety.

Exports from Honduras increased after the war and reached a peak of 21.5 million stems in 1958, but have been declining since that time and only totaled 17.2 million stems during 1960. Most of the bananas are grown along the banks of the Aguan and Ulua Rivers, where the land consists mostly of rich soils deposited by the rivers. As is the case in most of the Middle American countries, the bananas are grown on large plantations owned and operated by the American banana companies. Floods and blowdowns are common, particularly the former, which causes extensive damage to the plantations almost every year. Both the Cavendish-type and Gros Michel varieties are grown and almost all the exports are to the United States, with a small quantity to Europe. Over 10 million of the new plantation-packed banana boxes were shipped from Honduras in 1961, by far the highest of any country.

Costa Rican banana exports have followed a similar pattern to those of Honduras. Exports increased after the war, reaching a peak of 15.6 million stems during 1951-55, but since that time have been declining and only totaled 10 million stems in 1960. There are large plantations located on both the Caribbean and Pacific Coasts. Blowdowns, floods, and fusarium wilt also plagued the plantations of this area, and much of the banana-producing land was abandoned because of Panama disease. Both the Gros Michel and Cavendish-type varieties are grown there and a giant plantation boxing plant is located on the Caribbean side.

Banana exports from Guatemala have fluctuated considerably since the end of the war. During the immediate postwar period, from 1945 to 1949, Guatemala was exporting an average of 10.4 million stems per year. From 1951 to 1955, exports averaged only 6.7 million stems, but since 1956 they have been showing an increasing trend and totaled 12.1 million stems during 1960. Blowdowns, floods, and government intervention are the main causes of these fluctuations. It is estimated that over half of Guatemala's potential production was wiped out by winds during the 10-year period from 1945 to 1955.

Bananas are grown on both the Pacific and Caribbean sides of Guatemala. Panama disease is a serious problem and banana lands are continuously being abandoned as they become infested with the disease. However, there is enough new land available to continue the present rate of banana production in Guatemala. Most of the fruit is shipped to the United States and Canada and is of the Gros Michel variety.

Panamanian banana exports have also fluctuated since the war. During the period 1945 to 1949, exports were down, averaging only 7.1 million stems per year. Exports picked up slightly during 1951-55, averaging 8.6 million stems per year. This was still lower than the prewar average. Subsequently, however, exports have picked up considerably, totaling 11.1 million stems in 1956, 12.8 million in 1959, and 13.4 million in 1960.

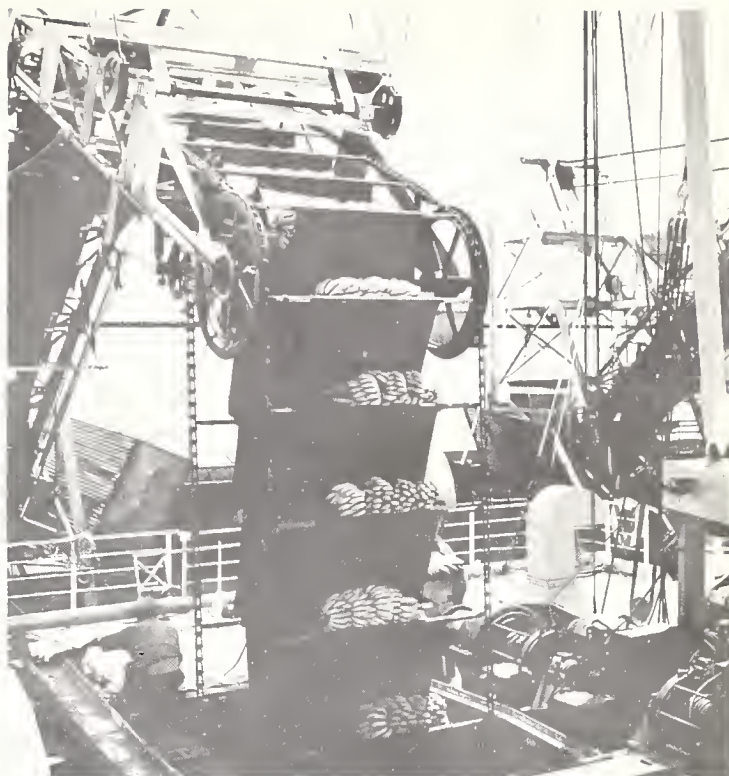
As in Guatemala, bananas are produced on both coasts of Panama, with most of the Pacific Coast production concentrated near Armmulles, and the Atlantic Coast production, near Almirante. The bananas are shipped from both coasts and all exports go to the United States and Canada. Both Gros Michel and Cavendish-type varieties are now being exported.

Colombian banana exports have remained fairly constant since 1951-55, when they reached the prewar level. Exports dropped to an average of 3.0 million stems per year during the 1945-49 period, but this was due to the disruption of trade during and after the war. Since 1955, exports have remained between 8 million and 10 million stems per year, which is slightly higher than the 1951-55 average of 7.5 million stems.

Colombian banana production is concentrated on the northwestern coastal lowlands, around Barranquilla and Santa Marta. Some of the plantations are owned and operated by an American company, but these plantations produce only a small part of the bananas exported. Most of the fruit is grown by small growers who own and operate their own plantations. About half of these growers have an arrangement under which the American company will spray their plantations for Sigatoka disease and also provide technical help; in return, growers sell their fruit to the company, which handles the marketing. The remaining producers have organized co-ops which negotiate sales. Practically all Colombia's bananas go to Western Europe; none are being shipped to the United States.

Panama disease has not infested the banana lands of Colombia; thus, the Gros Michel variety is still grown. Blowdowns and floods occur, however; it is estimated that 25 percent of the annual crop is destroyed by winds.

Since the end of the war, several of the Caribbean islands have been increasing their banana exports. The most important of these are Guadeloupe, Martinique, The Windward Islands, and the Dominican Republic. Together they shipped 23.1 million stems during 1960, which was an increase of 19.4 million over 1935-39 average, and 15.1 million stems higher than the 1951-55 average. With the exception of the Dominican Republic (which accounted for 34 percent of these shipments), these areas are high-cost producers of bananas and the quality of the fruit is only fair. Water is scarce, the soils are not fertile, and Sigatoka and Panama disease are present. Wind is also a problem, as there is not much protection for the plants on the open islands. These disadvantages, however, are



Bananas move into ship's hold along conveyor belt. At the less modern ports, they are carried aboard.

offset by the preferential treatment these islands receive in the United Kingdom and French markets -- namely, no duties, no trade restrictions, and subsidizing of production in a variety of forms. On the other hand, bananas imported from other areas enter under strict import restrictions and high duties. Cavendish-type is the principal variety of bananas grown on these islands.

Brazilian banana exports have been increasing steadily since 1957, when the prewar level of 9.3 million stems was reached. Exports during 1960 totaled 10.0 million stems, ranking Brazil as the sixth largest banana exporter in the world. However, historically, 90 percent of Brazil's banana exports go to Argentina under a bilateral trade agreement. Most of the remaining 10 percent goes to Uruguay, with a few stems finding their way to the United Kingdom and West Germany.

The States of Rio de Janeiro and São Paulo are the main areas where bananas are grown commercially in Brazil, and over 98 percent of the fruit exported is shipped through the port of São Paulo. The fruit is small in size and of poor quality, which accounts for its absence in the important world markets of North America and Western Europe. Cavendish-type is the principal variety exported. However, a few of the minor varieties are also shipped.

Outside of Middle America and South America, Africa is by far the most important area exporting bananas to the world markets. In fact, the only other areas of any consequence are Taiwan and Australia, whose exports are limited to Japan and New Zealand, respectively. During 1960, exports from Africa totaled 25.1 million stems, or 14 percent of the world total. The Canary Islands are the most important exporting area in Africa, shipping 8.3 million stems during 1960. Most of the fruit is shipped to Spain and the United Kingdom, with some going to other European countries. The cost of production on these islands is very high, as the bananas have to be irrigated all year round, the climate is not suitable for economical production, and yields are low. The bananas are grown on small farms, along with other crops. The Dwarf Cavendish variety is grown, due to the presence of Panama disease, and also the short, stocky plants are more resistant to the constant winds blowing on the islands.

With the exception of Somali, the remaining African banana-producing countries (Cameroun, Congo, Ghana, Guinea, Ivory Coast, Mozambique, and Nigeria) are very similar in their trading and producing practices. All were at one time, overseas territories of the major powers of Western Europe, and thus have substantial trade advantages over remaining world banana producers in these markets. Production costs in these countries are high, yields are low, and the quality is poor, which makes it difficult for them to compete in outside markets. They would not be producing on the present scale if prices were not kept high by their protected market. Exports during 1960 ranged from 1.6 million stems from the Congo to 3.0 million stems from Nigeria. Mozambique exported only 0.8 million stems.

In all these countries, bananas are grown on both large, foreign-owned plantations and on small ones owned by the indigenous population. It has only been within recent years that the latter type of banana production has taken hold, but in several of these countries as much as one-half of the banana production is now on small farms. Both the Gros Michel and Cavendish-type varieties are grown; however, the former is decreasing in importance because of the spread of Panama disease.

In the case of Somali, bananas are grown on plantations, most of which are owned by Italians. The producers belong to cooperatives which market the bananas, and all the fruit is exported to Italy under the control of the quasi-government banana market monopoly. The monopoly assigns quotas to each cooperative, which in turn allots them to the growers. Due to poor climatic conditions, namely hot dry weather and strong winds, banana production is inefficient and fruit is small and of poor quality. Cavendish-type are the main varieties grown. During 1960, Somali exported 3.4 million stems of bananas, which was its largest export item.

TABLE 2.--Imports of bananas into specified countries, average 1935-39 and 1951-55, annual 1958-60

Continent and country	Average		1958	1959	1960 ¹
	1935-39	1951-55			
	1,000 stems	1,000 stems	1,000 stems	1,000 stems	1,000 stems
North America:					
Canada.....	2,250	5,748	6,469	6,774	7,569
United States.....	61,192	62,247	71,265	77,218	82,824
Total.....	63,442	67,995	77,734	83,992	90,393
Europe:					
Austria.....	49	176	768	1,117	1,241
Belgium-Luxembourg.....	914	1,896	2,684	2,694	2,784
Denmark.....	190	869	1,081	1,110	1,136
Finland.....	126	151	292	319	330
France.....	7,416	11,339	15,390	14,889	14,119
Germany, West.....	² 5,512	6,112	18,608	18,882	19,801
Ireland.....	254	270	239	258	328
Italy.....	954	1,579	2,747	2,695	3,832
Netherlands.....	1,273	1,120	2,273	2,506	2,621
Norway.....	332	236	1,258	1,040	1,077
Spain.....	2,084	2,560	3,389	4,305	4,450
Sweden.....	471	1,819	1,747	1,694	1,704
Switzerland.....	282	746	1,489	1,545	1,975
United Kingdom.....	13,186	10,639	13,813	14,963	15,433
Total.....	33,043	39,512	65,778	68,017	70,831
South America:					
Argentina.....	6,862	7,289	11,034	10,491	10,145
Chile.....	653	879	601	1,315	1,660
Uruguay.....	445	850	627	614	983
Total.....	7,960	9,018	12,262	12,420	12,788
Africa:					
Algeria.....	200	358	571	608	608
Morocco.....	71	283	389	431	500
South Africa, Rep. of	198	508	302	372	450
Tunisia.....	95	87	82	102	80
Total.....	564	1,236	1,344	1,513	1,638
Asia:					
Japan.....	5,570	1,268	1,630	1,653	1,869
Syria.....	---	211	420	337	320
Total.....	5,570	1,479	2,050	1,990	2,189
Oceania:					
New Zealand.....	524	725	1,440	1,423	1,500
World total.....	111,103	119,965	160,608	169,355	179,339

¹ Preliminary. ² All Germany.

Note: Converted to 50-pound stems.

Importing Countries

The United States is by far the largest consumer of bananas in the world, importing 82.8 million stems during 1960, which was nearly one-half of the world's total imports. The Western European countries are the next most important market, taking 70.8 million stems, or 39 percent of total world imports. The remaining 14 percent is distributed among many countries, the principal ones being Canada, Japan, Argentina, and New Zealand.

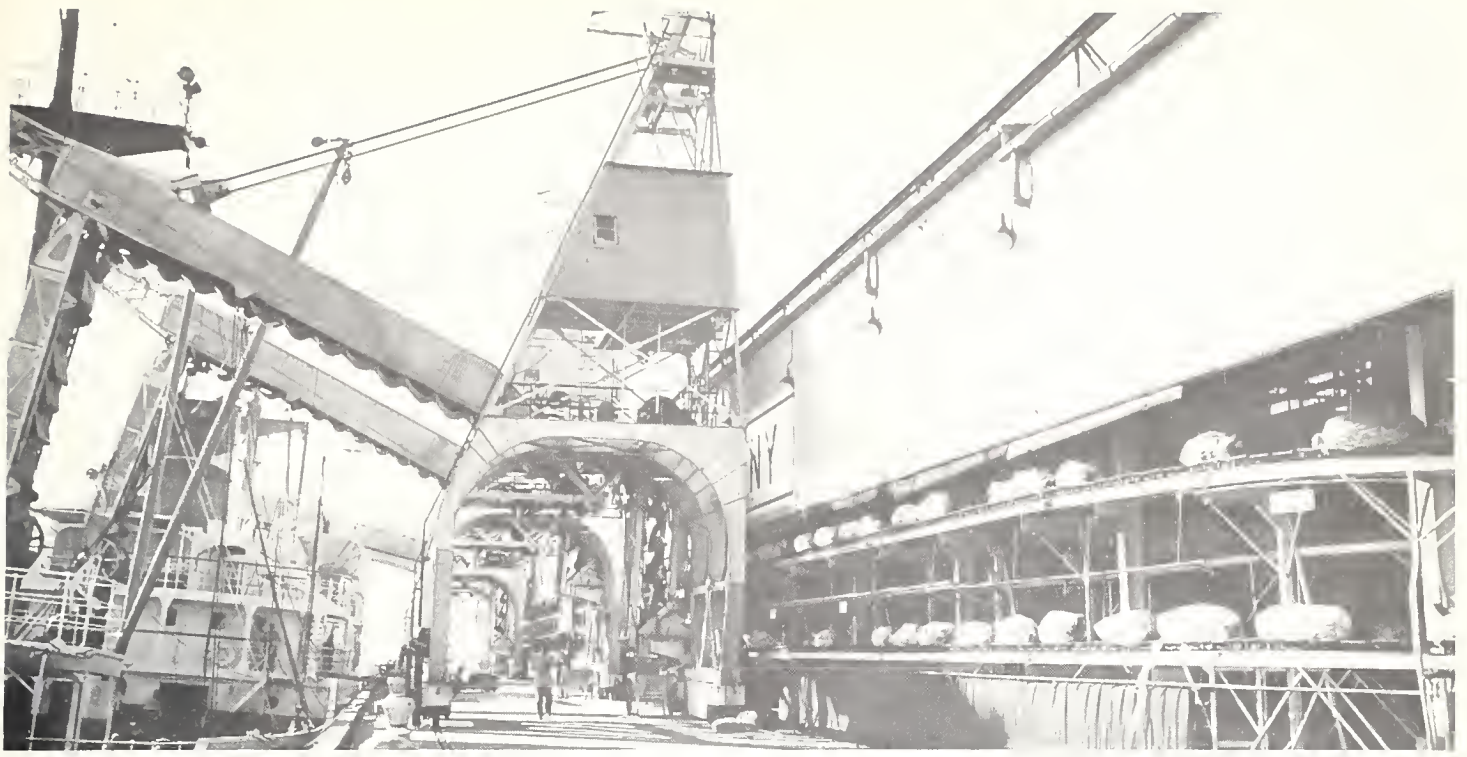
U.S. banana imports have been increasing steadily since 1951-55, when the prewar average was reached. These increases are a result of growing population and higher per capita consumption. Per capita consumption of bananas in the United States for 1960 was 23 pounds, an increase of 10 percent over 1950. The main factor responsible for this rise has been the availability of bananas at lower prices.

During the past 10 years, Ecuador has emerged as the leading exporter of bananas to the U.S. market, accounting for over 42 percent of total U.S. imports during 1960, compared with only 11 percent during 1950. Prior to 1950, Honduras, Guatemala, Panama, Costa Rica, and Colombia were the leaders, but they have not been able to keep their share of the market since that time. Today their share has dropped to about 55 percent, or a decrease of 19 percent since 1950. There are several other countries from which the United States imports small quantities of bananas, the principal ones being Mexico and the Dominican Republic, but their supplies are not important when compared to total U.S. imports.

Bananas enter duty free into the United States, and there are no quantitative restrictions. As long as the fruit is green, it will meet plant quarantine requirements.

TABLE 3.--Per capita consumption of bananas in major importing countries, 1955 and 1960

Continent and country	Banana imports		Population		Per capita consumption		
	1955	1960	1955	1960	1955	1960	Change
	1,000 lbs.	1,000 lbs.	Thousands	Thousands	Lbs.	Lbs.	Lbs.
North America:							
United States.....	3,187,600	4,141,200	162,300	177,400	19.5	23.3	+3.8
Canada.....	295,300	378,450	15,698	17,814	18.8	21.2	+2.4
Europe:							
Austria.....	23,350	62,050	6,977	7,090	3.3	8.8	+5.5
Belgium-Lux.....	109,250	139,200	8,896	9,185	12.3	15.2	+2.9
Denmark.....	60,150	56,800	4,454	4,590	13.5	12.4	-1.1
Finland.....	16,800	16,500	4,266	4,475	3.9	3.7	-0.2
France.....	596,450	705,950	44,300	45,500	13.5	15.5	+2.0
Germany, W.....	469,900	990,050	51,700	55,800	9.1	17.7	+8.6
Italy.....	98,650	191,600	48,180	49,550	2.0	3.9	+1.9
Netherlands.....	73,550	131,050	10,822	11,555	6.8	11.3	+4.5
Norway.....	17,100	53,850	3,441	3,602	5.0	15.0	+10.0
Spain.....	150,050	222,500	28,220	29,400	5.3	7.6	+2.3
Sweden.....	105,900	85,200	7,290	7,515	14.5	11.3	-3.2
Switzerland.....	44,000	98,750	5,004	5,330	8.8	18.5	+9.7
United Kingdom....	687,100	771,650	51,100	52,380	13.4	14.7	+1.3
Asia:							
Japan.....	53,750	93,450	89,000	93,600	0.6	1.0	+0.4



Above, gantry cranes and conveyor belts are used to unload bananas in New Orleans. Right, worker grades stems of bananas as they pass along conveyor belt.

Canada is also an important world banana market, and is very closely related to the U. S. market. Per capita consumption during 1960 was 21.2 pounds per person, or second only to the United States. Banana imports have also been increasing, totaling 7.6 million stems during 1960, compared to 5.9 million during 1955. Ecuador supplies over 40 percent of Canada's bananas, with the remaining 60 percent coming mostly from Honduras, Panama, and Costa Rica. Bananas also enter Canada duty free without any quantitative restrictions.



The European market for bananas has been expanded sharply during the past 10 years. Banana imports into Europe during the 1951-55 period averaged slightly over 39.5 million stems, and by 1960 they had jumped to over 70.8 million stems. This sharp increase was primarily the result of the fast recovery of the European economy during this period, increases in population, and the availability of bananas at favorable prices, except in Italy. With the exception of Denmark, Sweden, and Finland, per capita consumption has increased in all the banana importing countries of Europe during the past 5 years. These increases range from 2.0 pounds per person in France to 10.0 pounds in Norway and 9.7 pounds in Switzerland. European banana supplies are obtained chiefly from Latin America, the Cameroun, the Canary Islands, and other European Overseas Territories. Western Germany, France, and the United Kingdom are the leading importers of bananas, taking 19.8, 14.1, and 15.4 million stems, respectively, during 1960, or 70 percent of total European imports.

Over 98 percent of the bananas imported into West Germany come from Latin America, principally from Ecuador, Colombia, Honduras, and the Dominican Republic.

The remaining imports are mostly from Africa. Per capita consumption of bananas in West Germany was 17.7 pounds per person in 1960, an increase of 8.5 pounds over 1955. Before the advent of the Common Market, bananas entered freely and without having to pay the duty. However, under the Common Market treaty, a duty of 20 percent ad valorem will eventually apply to bananas entering Germany from areas outside the Associated Overseas Territories of the six countries in the Common Market. At present, the treaty provides Germany with a duty free quota for bananas entering from outside countries, based on 1956 imports; but this quota will be reduced periodically and finally abolished. The United Kingdom and France import most of their bananas from their Associated Overseas Territories. Jamaica, the Windward Islands, and Nigeria are the main sources of supply for the United Kingdom, and French West Africa, Cameroun, Guadeloupe, and Martinique for France. Both France and the United Kingdom give their AOT's preferential treatment, and they restrict imports from other areas. Per capita consumption in both countries has been fairly stable during the past 5 years, totaling 14.7 pounds per person in the United Kingdom during 1960, and 15.5 pounds for France.

Most of the banana imports into the remaining European countries, with the exception of Italy, come from Latin America, particularly from Ecuador and Colombia. Belgium imports large quantities of bananas from the Congo, but Ecuador is still its principal supplier. Similarly, with the exception of Italy and Finland, bananas enter relatively unrestricted and with low tariffs into these markets. In the case of Italy, all banana imports are controlled by a quasi-government monopoly, and they all come from Somali. Finland restricts imports of bananas due to balance-of-payments difficulties, which is also the case with other fruit. Per capita consumption in all these countries, with the exception of Finland, Sweden, and Denmark, has increased during the past 5 years. In the latter two countries, per capita consumption has decreased 0.2 and 1.1 pounds, respectively, since 1955.

Except for Argentina, the remaining world banana markets are small, but combined, they help relieve the pressure of overproduction. In other words, if their imports had to be absorbed by the larger markets of the world, prices would be adversely affected.

Outlook

The long-range outlook for bananas is for continued pressure to produce more in the major producing countries. Plenty of land is available for banana production, in spite of the inroads of Panama disease; and as technology and cultural practices improve, production per acre will increase. Also, as marketing and packaging methods improve, losses incurred from the time the fruit is harvested until it reaches the consumer will be reduced.

However, the extent to which world banana production can be increased will depend on the ability of the exporting countries to expand world markets.

There should be an opportunity to expand the consumption of bananas in Western Europe, provided the trade barriers are removed and duties are established at reasonable levels in the Common Market countries of Europe. By allowing imports only from certain countries, the quality of bananas offered to consumers in several countries has been poor, and prices are high relative to other fruit.

Japan and Italy are the two outstanding examples of countries that are in an economic position to trade with all banana producing countries, but they have had severe restrictions on trade. If per capita consumption in these two countries should increase to the 1960 level in West Germany, the United Kingdom, and France of 16.0 pounds, then there would be an additional market for 39 million stems.

U. S. imports of bananas will most likely continue to increase along with population but per capita consumption will probably change little, since it is already high. Therefore, it would appear that, unless restrictions are removed from other world markets, thus allowing per capita consumption in these markets to increase, future increases in world exports will be limited to increases in population in the currently established world banana markets.

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